Protek 783O

Handheld Spectrum Analyzer 2.9GHz

USER'S MANUAL

GS Instruments Co.,Ltd.
www.gsinstrument.com

In order to keep the Protek 783O Spectrum Analyzer continuously updated, information in this manual is subject to change without notice. **Please contact us, if you have any question about version upgrade and amendment.**

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Safety Term and symbols

Danger statements identify condition or practices that could result in injury or loss of life.

Caution statements identify conditions or practices that could result in damage or fire.

Ground statements identify conditions or practices that could connect protective conductor.

Caution for safety

- **Prohibiting to removal the cover**

Do not remove the instrument cover to access the internal components. Only GS Instruments' Service team or technician with knowledge of the instruments' condition and dangerous voltages can repair the instrument.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

- **Keep the power insert clean**

Instrument's power insert should remain dust free.

Clean the power insert regularly. Dust could result in damage to this instrument.

Continually cleaning the dust on input terminal of RF frequency counter.

Clean the input terminal regularly. Dust could result in damage to the instrument.

- **RF in/output rating**

Rating of RF input and output connector

Maximum DC voltage rating

RF input connector (socket): N type female, 50Ohms

Maximum RF input power: 5Vrms

Caution: Do not use over 5Vrms supplied and/or (-) power could result in damage to this instrument

Do not operate this instrument if there is any doubt it is functioning properly: if operating personnel feel the instrument is not operating properly, return this instrument to GS Instrument for service and repair to ensure the safety features are maintained.

- **DC Power** 

The operating Personnel must use the DC adaptor supplied, combining this instrument. The other adaptor could result in damage to this instrument and it is the limitation of warranty Exterior DC input connector should be matched with polar. DC connector tip must attach with (+) polar grounding.

The operating personnel must use grounded power Restore this instrument

- **Restore this instrument** 

Do not attempt to operate this instrument for long durations and avoid restoring this instrument.

* Avoid direct light
* Keep away the heating system
* Avoid high temperature (Ex. Inside of the car during the summer time)
* Keep about from liquids
* Avoid high moisture and/or poor ventilation
* Keep away dust and/or smoke
* Avoid extremely low temperature

Keep away from hazard of return strokes

Protek 7830 Ni-MH battery is rechargeable. Battery is recharged bases on the battery temperature. Charging is controlled from the power of the battery cell and the temperature of the battery. Ni-MH Rechargeable battery is going to increase temp slowly until the temperature is extremely higher. Battery charging is finished automatically by checking the degree of the temperature (dT/dt). For battery protection, when the power of Battery cell is increased, comparing regular temperature and/or exterior temperature degree of when the temperature increases over 50 degrees, battery charging will be finished automatically.

Operating personnel must use Ni-MH Rechargeable Battery and do not operate in an explosive atmosphere.

- The battery usage time can change due to the using term, environment and temperature.
- When battery consumption is large battery-running time will decrease.

Operating personnel should phase in a new battery when battery-running time is less than half (Warrant period is 6 month, after instrument use has begun.)

- Operating personnel should not use this instrument and/or keep the battery in place for long periods of time, which could result in discharge of the battery.
- **To avoid damages to battery, when battery is low, this instrument will turn off automatically.**

Warranty

Limited Warranty. GS Instrument product is warranted against defects in material and workmanship for a period of one year from the date of shipment. During the warranty period, GS Instrument Company will, at its option, either repair or replace products that prove to be defective.

◎ Below is the limitation of warranty per this manual:

◎ Buyer misuse, unauthorized modification or repair of product

◎ Operating personnel use this instrument against specification.

◎ Defect resulting from improper or inadequate maintenance by buyers.

◎ Defect is Caused by the environment such as fire, flood or earthquake.

◎ Buyer installs substitute parts or performs any unauthorized circuit and/or consumption good substitution.

◎ Buyer operates instrument against the environmental specifications for this instrument.

With the exception of the above articles, GS Instruments product is warranted for initial purchaser.

If this instrument is resold the end-user, warranty is not transferred.

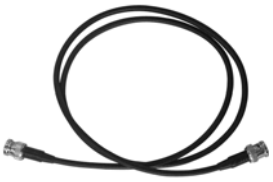
The foregoing warranty shall not apply to defects resulting from outside the environment and/or misuse.

Accessories

Carrying case

AC Adaptor

Carrying Strap



Coaxial Cable

RS-232 Cable

Power Cable

Ear Phone

N-BNC Adaptor

Antenna

Ni-MH(Rechargeable Battery) 6PCS

User's Manual X 2PCS

GUI Software CD

※ Standard Option

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6. Description of key operating

1 Introduction

Overview

The Protek 7830 is handheld Spectrum Analyzer and it is optimized to analyze a signal for the radio frequency equipment that is increased for the use of frequency, gradually higher speeds, and digitalized. The Protek 7830 has adopted synthesizer method and has a wideband reception range of 100 kHz to 2,900 MHz. The characteristic of frequency response of the Protek 7830 is calculated by memorized calculation data, and so it enables the Protek 7830 to measure accurate level and make easy analysis for wide range of frequency band.

The Protek 7830 provides various functions and user-friendly interface which makes it easy for the user to check the location of the antenna with simple handling. The Spectrum Analyzer is ideal for user to test, install and maintain Mobile Telecommunications Systems, Cellular and Cordless Phone, CB Paging, Paging Systems, Cable and Satellite TV Systems as well as antenna site measurements and maintenance. The Protek 7830 supports RS 232C serial communication and has separate GUI software. So, user can control the Protek 7830 easily after connecting the Protek 7830 with his personal computer, and can utilize the analyzed data variously after converting or saving numerical value or graph.

2 Features

Main features

- 100 kHz to 2,900 MHz measurement range
- Frequency Spectrum Analyzing Function and Frequency Counter Function
- Measure and demodulates N-FM, W-FM, AM, SSB signals
  

- Built-in 2 GHz Frequency Counter
- Accurate Signal Level Measurement
- Marker/delta Marker/Squelch Adjustment Function
- Peak Search/Marker to Center Function
- Channel Power Measurement Function
- PLL tuning system for precise frequency tuning
- Built-in Speaker
- 192 Pixels X 192 Pixels Back Light LCD
- Menu selection method for Function selection
- RS-232C Interface
- User-friendly Icon Display
- Maintenance of Wireless Telecommunications Equipments
- General Usage for Installation and Maintenance of telecommunications Equipments
- Installation and Maintenance of Cable
- RFID Tag RF Strength Measurement
- Jammer (for hospital, theater and military) Performance Test
- Installation and Maintenance of Satellite Antenna
- Detection of Tapping and Hidden Camera

3 Functions

Spectrum Analyzer

- Spectrum: Peak Search, Marker to Center, Channel Power Function
- Internal Attn.: The input range can be extended by internal
- Max 30 dB Attn. function.
- Sweep Mode: Single Run, Free Run, Squelch Run Selectable
- Squelch Function: The Squelch Level may be adjusted to any value from the reference level to Full Scale.
- Copy Function: The Copy Set mode allows the contents of the Channels edit Setup and Data memories to be copied to an external device. Data may also be written into these memories from external device

Frequency Counter

- Frequency range: 35 MHz to 2,900 MHz
- No. of digits: 7 digits
- Resolution: 1 kHz

Specifications

Frequency

Frequency Range	100 kHz to 2,900 MHz
Resolution	Min. 3.125 kHz
Accuracy	TXO : ± 3 PPM / Display : ± 1.5 PPM
W-FM / N-FM / AM / SSB	Wide FM : Approx. 180 kHz @-6 dB Narrow FM : Approx. 12.5 kHz @-6 dB AM/SSB : Approx. 2.4 kHz @-6 dB
Step Range	AM, SSB, Narrow FM : 6.25kHz, 12.5kHz Wide FM : 6.25~125kHz (Multiple of 6.25 kHz) 125~2500kHz (Multiple of 125 kHz)
Span Range	AM, SSB, Narrow FM : 1MHz, 2MHz Wide FM : 1~20MHz (Multiple of 1 MHz) 20~400MHz (Multiple of 20 MHz)
Frequency Selection Mode	Center, Start/ Stop, Span

Amplitude

Measurement Range	-20 dBm to −110 dBm
Average noise Level	Wide FM : -100 dBm Max. Narrow FM : -110 dBm Max. AM/SSB : -100 dBm Max.
Amplitude Units	dBm, dBmV, dBuV
Reference Level Accuracy	Typical 1.5 dB (@20~30℃/W-FM) Typical 1.5 dB (@25℃/N-FM/AM/SSB)
Reference Level Range	+120 dBm to −80 dBm
Log Scale	0.2 dB/DIV min, in 0.25 dB Span (5 Display Division)
Internal Attn	10 dB, 20 dB, 30 dB, 35 dB Max.
Internal Attn Accuracy	1.0 dB (@25 ℃)

Specifications

Sweep

Speed	Min. 500 msec
Trigger Source	Narrow FM / Wide FM / AM / SSB
Trigger Mode	Free Run / Single Run / Continuous Wave / Squelch Run
Trigger Level	TTL Level
Marker Mode	Maker / Delta Maker / Peak Search / Marker to Center / Channel Power

Memory

Trace & Setup Storage	Max 100 Waveforms and 100 States

Display

Type	Mono STN LCD
Display Resolution	192 Pixels X 192 Pixels
LCD Light	On / Off

Frequency Counter

Frequency Range	35 MHz to 2,900 MHz
Resolution	7 Digits
Accuracy	±50 PPM ±1 COUNT
Sampling Time	1 sec
Input Sensitivity	9 MHz to 2,000 MHz : 150 mVrms 20 MHz to 1,000 MHz : 100 mVrms 2,000 MHz to 2,900 MHz : 400 mVrms
Input Impedance	50 Ohms
Max. Input Voltage	5 Vrms Max.

Specifications

Spectrum input Port

RF Input Connector	N type Female, 50 Ohms
Max Input Level	Max. +10 dBm, 5Vrms

Operation Environment

Operating Temperature	0 ℃ to 40 ℃
Humidity	35 RH to 85 RH
Storage Temp.	10 ℃ to 50 ℃

Power Source

Battery Power Source	AA Type Ni-MH Rechargeable Battery × 6 PCS
Battery Specification	AA Type 1.2 V, 2,700 mAh Rechargeable Nickel Metal Hydride Battery
Adapter	SMPS Type AC Adapter (DC 12 V Output) Car-Adapter (DC 12 V Output)
Auto Power On/Off	Off/ 5 min./ 10 min./ 20 min./30 min.

The Protek 7830 can be quickly recharged using a Ni-MH Rechargeable Battery. The Recharged method of Ni-MH Battery is controlled by the voltage of Battery Cell and the temperature of Battery. The external temperature of Ni-MH Rechargeable Battery is gradually increased and then quickly increased in some point of time. The Protek 7830 closes charging quickly after checking the increased amount (dT/dt) of external temperature of Battery for a unit time. Also, for Battery protection, the recharging is compulsory closed by built-in temperature sensor in case that the voltage of Battery Cell will be increased to more than some specified level or the external temperature of Battery will be going up to over 50℃. For safe usage, it is strongly recommended to use Ni-MH Rechargeable battery, and please do not use in the place with high temperature or high humidity during recharging.

Specifications

Physical Specifications

Dimension	4.4 ”(W)×10 ”(H)×2.3 ”(D)
Weight	Approx. 0.70 Kg(1.54 lbm) (including Antenna, except Battery)

Standard Accessories

Antenna (Receive Only), SMPS Type AC Adapter, Fuji-AA type NI-MH Rechargeable Battery (6 PCS, 1.2 V 2,700 mAh), Manual, Coaxial Cable, Earphone, Carrying Case, Carrying Belt, RS-232C Cable, Adapter(N-BNC), Software for PC Application

Optional Accessories

Matching Pad (75 Ohms to 50 Ohms), F-BNC Adapter, Car Adapter, Block Voltage Unit

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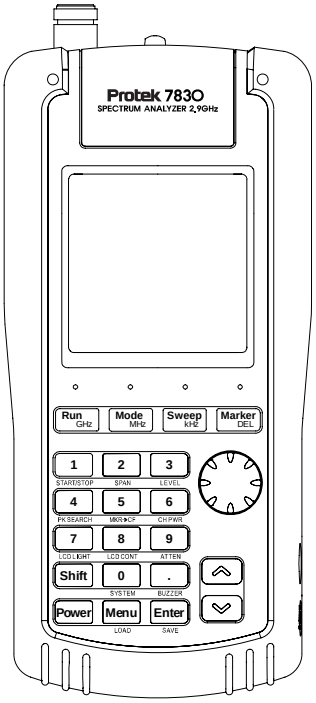
Instrument overview

Front Panel

Front Figure



LCD

The LCD screen can display the signal input level, frequency and amplitude values, and the relative system data

Key Pad

- **Power Key**

  Key to turn ON/OFF the system

- **Run / Mode / Sweep / Marker Key**

- **Run**

  Key to run the Scanning or input the GHz unit for frequency value input

- **Mode**

  Key to set up the Reception Mode or input the MHz unit for frequency value input

- **Sweep**

  Key to set up the Sweep Mode or input the kHz unit for frequency value input

- **Marker**

  Key to select the Marker Function:
  Marker, Delta Marker, Squelch Marker, Peak Search, Marker to Center, and Channel Power

- **Numeric Key**

  Key to input the frequency value

- **Menu Key**

  Key to set up the required functions of system

- **Up/Down Key**

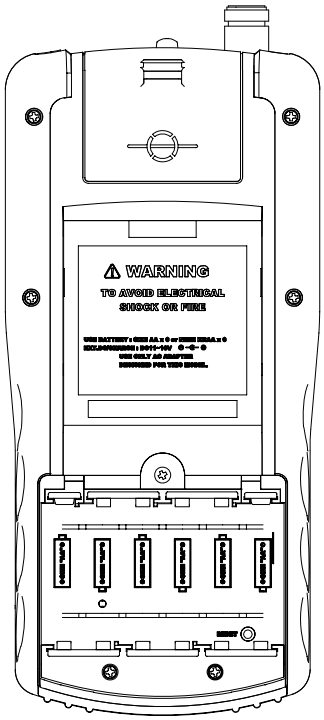
  Key to select the Menu or Frequency Value

- **Knob Key**

  The function of **Knob** key is same as the **Up/Down** keys

Rear Panel

Rear Figure



- **Belt Clip**

  User can yoke the Protek 7830 on a belt.

- **Speaker**

  User can use the speaker to output the modulated audio from RF signal level.

- **Reset Key**

  User can use this Reset key from system's malfunction or memory reset.

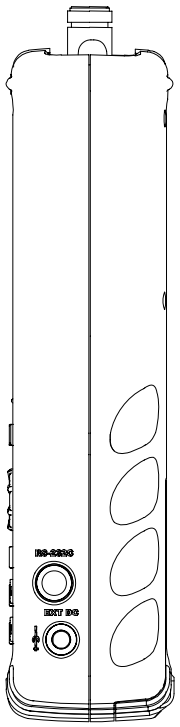
CAUTION

- **Battery**

  Note the polarity of batteries at inserted battery compartment. And user must use the AA type Ni-MH Rechargeable batteries for battery charging

Side Panel

Side Figure



- **DC Input Jack**

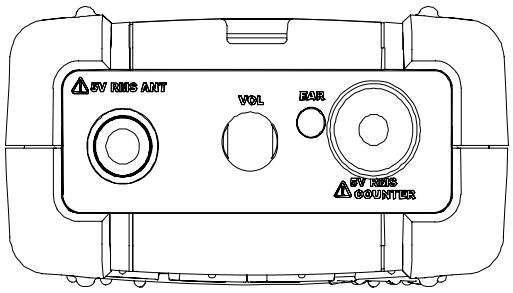
  User can use this DC input jack for power supply and battery charging with SMPS type AC/DC Adapter or Car Adapter.

- **RS-232C Connector (8 pin mini DIN connector)**

  User can use this RS-232C connector for PC communication with serial cable.

Top Panel

Top Figure



- **Input Connector for Signal Level**

  User can connect the antenna or coaxial cable to this connector on the system. The maximum input voltage is 5 Vrms.

- **Input Connector for Frequency Counter**

  User can connect the signal source to be measured to this connector. The maximum input voltage is 5 Vrms.

- **Volume Control**

  User can control the volume of audio output. To increase the volume of audio output, turn the Volume Control to clockwise direction.

- **Earphone Jack**

Basic operation

Before Power ON

How to insert and charge the AA Type Ni-MH rechargeable batteries?

For the insertion of batteries, please release the screw on the battery cover on the bottom of the instrument. And put in AA Type Ni-MH rechargeable batteries (Total 6 PCS).

To charge the batteries after inserting batteries, connect the DC cable plug of SMPS type adaptor to DC jack of system (DC output: 12V).

Battery charging will begin after DC cable in connected.

At this time, if user turns on the power of system, the battery icon on the display window is displayed and blinking. And if the charging of batteries is finished, the blanking of battery icon will stop and only be displayed.

Connection for Input Level

To measure the input level of RF signal, connect the antenna or coaxial cable to N-type connector of system (marked ANT)

- **Input Connector for RF Signal Level:**
  User can connect the antenna or coaxial cable to this connector on the system. The maximum input voltage is 5 Vrms

- **Input Connector for Frequency Counter:**
  User can connect the signal source to be measured to this connector. The maximum input voltage is 5 Vrms.

Power ON

To turn on the system power, Press the [Power] key.

The system power is ON. The last displayed screen from the previous usage will be displayed (Previous setup status).

This system supports the simple manipulation with frequently used function keys. To use this simple manipulation, press the [Shift] key and press the numerical key. The frequently used function is marked on the numerical key below.

The upper right icons are the basic 7830 mode and the SHIFT mode.

User can select the shift mode or basic 7830 mode by pressing the [Shift] key.

If the LCD screen is not readily visible, user can adjust the LCD contrast to see LCD screen.

To adjust the LCD contrast, press the [Shift] key. And press the **No. 8 (LCD Contrast)** [8] key. Until user's desired LCD contrast is adjusted, use the **Up/Down** [^][v] keys and Knob key.

To turn on the LCD light, press the [Shift] key. And press the **No. 7 (LCD Light)** [7] key. Then the LCD light is turned on.

And to turn off the LCD light, press the [Shift] key. And press the **No. 7 (LCD Light)** [7] key (Toggle ON/OFF).

For the LCD display, refer to below figure.

Turn on power of instrument

Power On

STEP 1

- Push the Power Key.

STEP 2 (Adjust to LCD Contrast)

- Push the Shift Key.
- Push the **LCD CONTRAST (No.8)** 8 Key.
- Adjust to desired **LCD Contrast** using the **Up/Down** ^ v Keys or **Knob** Key.

STEP 3

- Push the **Dot** . Key to be taken out of Menu.

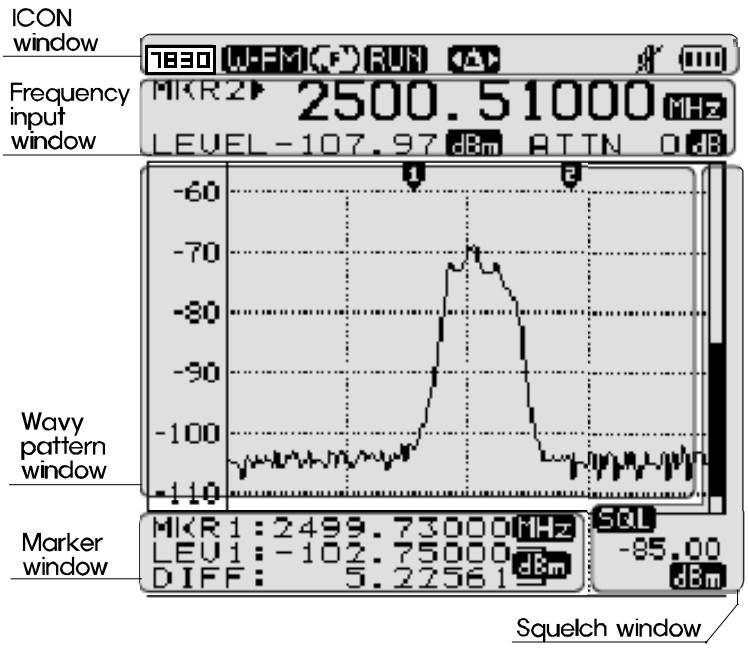
STEP 4 (LCD Light On/Off)

- Push the **Shift** Shift Key

STEP 5

- Push the **No. 7 (LCD Light)** 7 Key

Description of operating screen



1. ICON window **2. Frequency Input window**

3. Wavy pattern window **4. Squelch window**

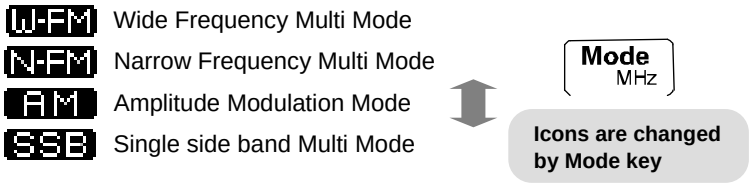
5. Marker window

1. ICON window

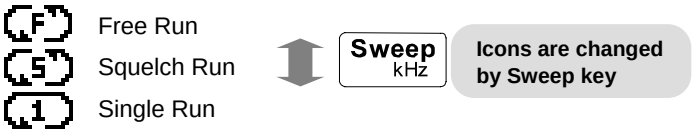
ⓐ	ⓑ	ⓒ	ⓓ	ⓔ		ⓕ	ⓖ
783O	W-FM	F	RUN				
SHIFT	N-FM	S	STOP	M			
	AM	1		A			
	SSB			S			

ⓐ **Shift State Indication**

ⓑ **Reception Mode State Indication**

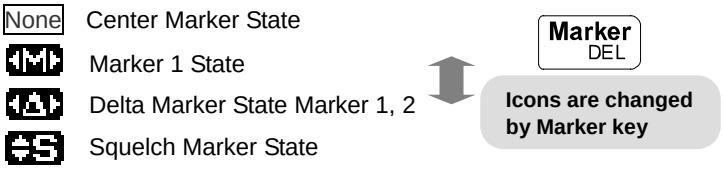


ⓒ **Sweep Mode State Indication**



ⓓ **Run-Scanning Run/Stop State Indication**

ⓔ **Marker State Indication**

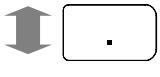


Description of operating screen

ⓕ **Buzzer On/off Indication**

Buzzer Off

Buzzer On



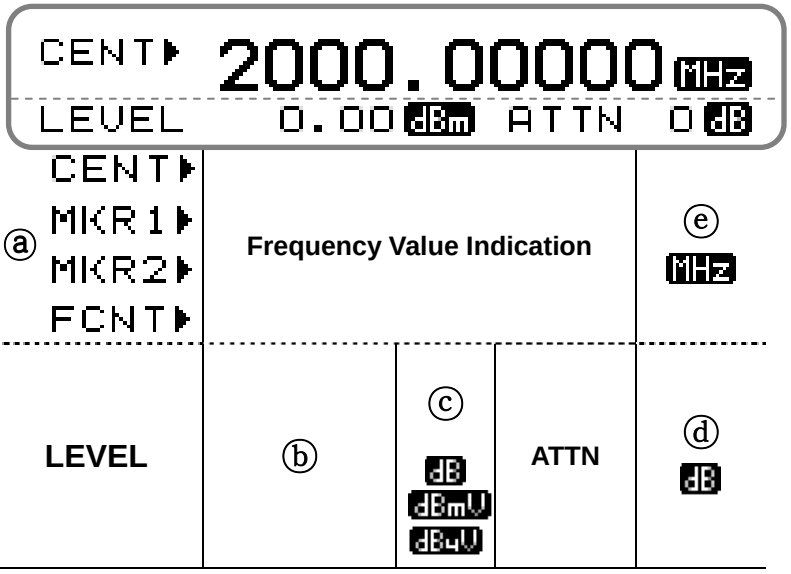
Icons are changed by Dot(Buzzer) key

ⓖ **Battery Residual Indication**

Full

Empty

2. Frequency Input window



ⓐ CENT▶ **Center Frequency Indication** NONE

MKR1▶ **Maker 1 Frequency Indication** 1MD

MKR2▶ **Maker 2 Frequency Indication** 2Δ1

FCNT▶ **Frequency Counter Value Indication** F.CNT

- Indication of Frequency Value of each Mode

ⓑ **Level Value Indication**

Indication of Level Value of each Mode.

ⓒ **Level Unit** dB dBmV dBμV

Can be established in Menu.

[Please refer to Menu Level Unit establishment for further details]

ⓓ **Atten. Establish Value** dB

Indicate established Atten. Value.

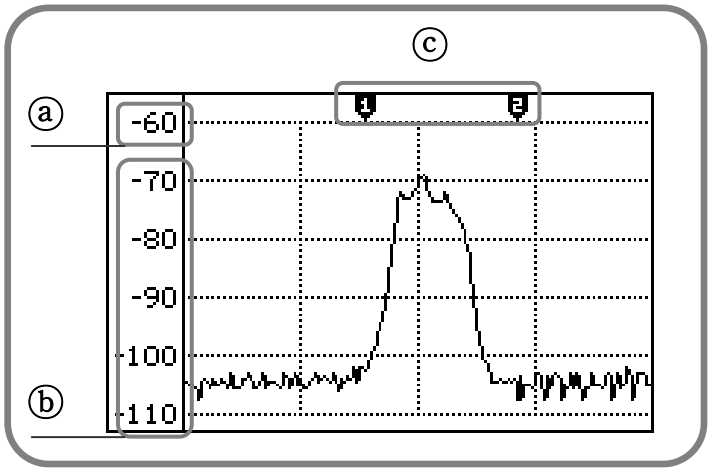
(Internal + External Atten. Value) [Please refer to Menu Level Unit establishment for further details]

ⓔ **Frequency Unit** MHz

Every Frequency Unit is indicated in MHz

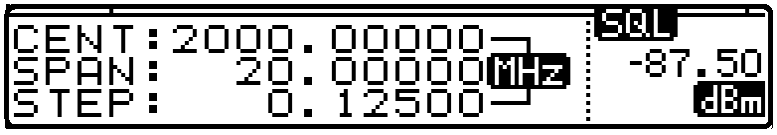
Description of operating screen

3. Wavy pattern window



ⓐ	Indication Reference Value of Screen Level Value		Indication to Vertical Level Value of Wavy pattern window. [Please refer to Screen Level establishment in Basic operation Explanation for further details]
ⓑ	Resolution of Screen Level Value		
ⓒ	Marker Indication		
	C	Center Marker	Every Marker can control the **Up/Down** keys or **Knob** Key.
	1	Marker 1	
	2	Marker 2	

4. Marker Window



ⓐ Center Marker, Marker 1, When Squelch Marker

CENT	Center Frequency	MHz
SPAN	Span Frequency	
STEP	Step Frequency	

ⓑ When Delta Marker

MKR1	Marker 1 Frequency	MHz
LEV1	Marker 2 Level Value	dBm
DIFF	Marker1- Marker2 Level Value	

ⓒ When Measure Channel Power

MKR1	Marker 1 Frequency	MHz
MKR2	Marker 2 Frequency	
CHPW	Possession Bandwidth average Level of Marker 1 and Marker 2	dBm

Reception Mode

Reception Mode has a total (4) four modes for Demodulation when receiving.

Wide-FM W-FM	Wide Frequency Modulation
	Wide FM RBW(Resolution Bandwidth) 180 kHz
Narrow-FM N-FM	Narrow Frequency Modulation
	Narrow RBW(Resolution Bandwidth) 12.5 kHz
AM AM	Amplitude Modulation
	SSB /AM RBW(Resolution Bandwidth) 2.4 kHz
SSB SSB	Single Side Band Modulation
	SSB /AM RBW(Resolution Bandwidth) 2.4 kHz

Wide FM should be used to interpret a large Signal of Band width, Narrow FM should be used to interpret a narrow Bandwidth Signal. AM and SSB can used irrespective of Bandwidth.

Push **Mode (MHz)** [Mode MHz] Key to establish the reception mode and then the top-left ICON will be changed to WFM W-FM, NFM N-FM, AM AM, SSB SSB order. When inputting Frequency like Start/Stop, Span etc, The **Mode (MHz)** [Mode MHz] Key is used.

RBW is fixed in each Mode as follows.

Wide FM RBW (Resolution Bandwidth) 180 kHz
Narrow RBW (Resolution Bandwidth) 12.5 kHz
SSB/AM RBW (Resolution Bandwidth) 2.4 kHz

Reception Mode Establishment

STEP 1

- Push the **Mode (MHz)** [Mode MHz] Key.

STEP 2

- Push the **Mode (MHz)** [Mode MHz] Key and the top left ICON will change to WFM W-FM, NFM N-FM, AM AM and SSB SSB order.

Sweep Mode

Sweep Mode is used to set up operation characters which interpret Input.

Every each operation character is same as follows.

F Free Run	Analyzing execution consecutively
1 Single Run	Only 1 time Execution
S Squelch Run	Run by higher than Squelch level (Similar Trigger Mode of Oscilloscope)

Establish this mode by pushing the Sweep (kHz) [Sweep kHz] Key and then the top left ICON will be changed to FREE Run F, SQUELCH Run S and SINGLE Run 1 order. The Sweep (kHz) [Sweep kHz] Key is used as input Start/Stop, Span and Input Frequency Unit into kHz Unit.

After input is finished Frequency, F FREE Run continues to execute Run-Scanning operation automatically.

S Squelch Run operation will stop Run-Scanning in case of Signal Level Value is getting higher than Squelch Level Value. But, If Signal Level is getting lower than Squelch Level, restart to Run- Scanning.

After input is finished Start/Stop Frequency, 1 Single Run execute Run-Scanning just a once. In addition, if it is desired to Run-Scanning, push the Run (GHz) [Run GHz] Key and then execute Run-Scanning once

Sweep Mode Establishment

STEP 1

- Push the **Sweep (kHz)** [Sweep kHz] Key

STEP 2

- Push the **Sweep (kHz)** [Sweep kHz] Key, and the top-left ICON will be Changed to F FREE Run, S SQUELCH Run and 1 SINGLE Run order.

Set up Span

Setting of step for Span means Frequency Resolution and Span can be from 1MHz to 400MHz. And the step at Narrow FM, SSB and AM can be set 1MHz to 2MHz. Wide FM from 1MHz to 20MHz is 1MHz step and step at 20MHz to 400MHz can be set at 20MHz step.

If the correct value is not set, value will be set to the nearest larger value automatically.

Example) If Span Input is 50 MHz, it would automatically be set at 60 MHz.

First, push the **Shift** [Shift] Key in order to set up Span. Then the top-left ICON is changed from [7830] to [SHIFT].

After that, push the No. Key. So then Frequency Input window changes the Span Input State.

Enter the Input Frequency and then input the Unit to use for this **Run (GHz)** [Run GHz]**, Mode (MHz)** [Mode MHz] or **Sweep (kHz)** [Sweep kHz] **Key** would be set up Span.

Regardless of Frequency Input State, upper Keys are only used the input units.

Set up Span Mode

STEP 1

- Push the **Shift** [Shift] Key

STEP 2

- Push the **No. 2** [2] Key
- When the **Sweep (kHz)** [Sweep kHz] Key is pressed, the top-left ICON is changed to [F] FREE Run, [S] SQUELCH Run and [1] SINGLE Run order.

Frequency Input

Chosen Reception Mode, Sweep Mode and Span are showed on the top center of LCD. At first, choose Reception Mode and Sweep Mode to get a sense of the Frequency Bandwidth and a specific feel for analyzing.

Choosing Frequency Value is a way to inputting Center and Start/Stop Frequency.

To order to input Center Frequency just pushes the numeral keys.

Press the key when Frequency Input Window is a CENT state.

Push the **Shift** [Shift] Key to input Start/Stop Frequency.

Push the **Shift** [Shift] Key to input Frequency you would like to analyze.

Push the **No. 1(Start/Stop)** [1] Key, to inputted Start Frequency in Frequency Input Window.

Input Frequency by using the **No. 0** [0] to **9** [9] Keys, **Dot (Buzzer)** [.] Key, **MARKER (DEL)** [Marker DEL] Key and **Run (GHz)** [Run GHz] as Unit Input Key, **Mode (MHz)** [Mode MHz] and **SWEEP (kHz)** [Sweep kHz] Key.

Execution will be done automatically, after inputting the last Unit in the Frequency, according to a given Sweep Mode of Run-Scanning Mode. If the mode is Single Run(1) , push the **Run (GHz)** [Run GHz] Key and then execute Run-Scanning again.

A wrong inputting content can be erased by using the **MARKER (DEL)** [Marker DEL] Key. The **MARKER (DEL)** [Marker DEL] Key operates like the Back space on PC

Inputting Frequency in out of Frequency Input Mode:

Frequencies can be deleted by pushing the **MARKER (DEL)** [Marker DEL] Key several times.

Erase inputted Frequency and then push the Marker (DEL) Key one more time, you are now out of Frequency Input Mode.

Frequency Input

STEP 1

- Check the state of Frequency Input Window.
  You can input Center Frequency when state of Frequency Input Window is **CENT** CENT.

STEP 2

- Input a desired Center Frequency

STEP 3

- Input Unit by using the **Run** [Run GHz], **Mode** [Mode MHz] and **Sweep** [Sweep kHz] Key

Start/Stop Frequency Input

STEP 1

- Push the **Shift** [Shift] Key

STEP 2

- Push the **No. 1** [1] Key

STEP 3

- Change Frequency Input Window to Start Input Mode.

Input a desired Frequency to use the numeral keys and the **Dot** [.] Key

STEP 4

- Input Unit to use the **Run** [Run GHz], **Mode** [Mode MHz] and **Sweep** [Sweep kHz] Key

STEP 5

- Change Frequency Input Window to Stop Input Mode.

Input a desired Frequency using the numeral keys and **Dot** [.] Key.

STEP 6

Input Unit to use the **Run** [Run GHz], **Mode** [Mode MHz] and **Sweep** [Sweep kHz] Key.

Adjust screen Level

Settle Top Level- Reference Level and Level Resolution on screen.

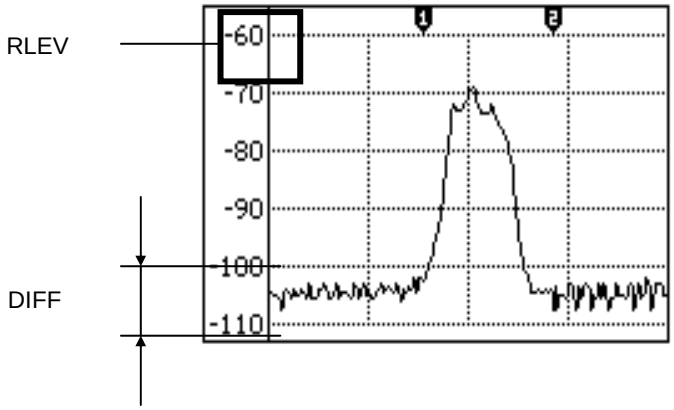
“RLEV” is an abbreviation of Reference Level.

Choose through the **Up/Down** Keys and establish the level using the **Enter** Key. Top Level in the vertical axis would be changed to be established Value.

“DIFF” is an abbreviation of Difference.

Choose through the **Up/Down** Keys and establish to use the **Enter** Key. Level Step in verticality axis would be changed established Value

RLEV	Choose through the **Up/Down** Keys and push the **Enter** Key.
DIFF	Choose through the **Up/Down** Keys and push the **Enter** Key.



Run-Scanning

Run-Scanning is a process interpreting Frequency according to established Frequency Bandwidth and Span. And Run- scanning processes operate by establishing Sweep Mode

Run-Scanning process would be accomplished by establishing Reception Mode and Sweep Mode(See above)

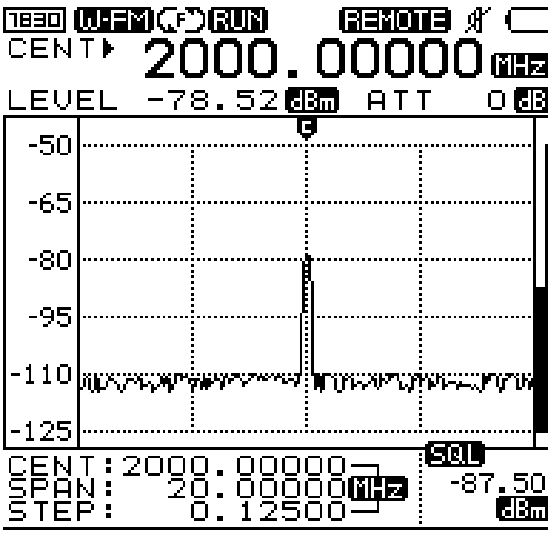
Marker

Protek 7830 has Center Marker, Marker 1, Delta Marker (Marker1 and Marker2) and Squelch Marker. Each Marker Mode can define a state of Marker ICON into the top-left Marker Mode ICON.

Marker Mode ICON	Marker ICON	
Center Marker No ICON		
Marker 1 		You can settle Marker 1 in this state.
Marker 2 		You can settle Marker 2 in this state.
Squelch Marker 		Fix the volume when listening by making a multiple Signal to audible Frequency Bandwidth to use FM/AM/SSB and then fix Basic Signal of Squelch Run.

Marker

Center Marker

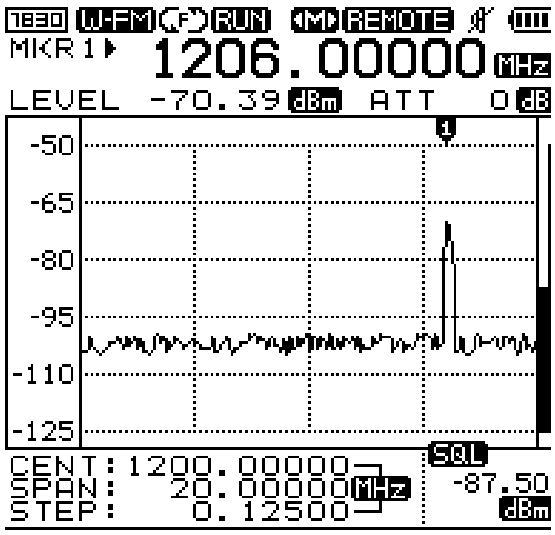


Center Marker is not a Mode the user will choose when using Mark Mode in Basic operation. When inputting Start Frequency and Stop Frequency, Center Frequency information will appear automatically.

The state is not indicated on the Mode ICON is Center Mode.

Frequency and Level on Center Frequency will be indicated on Frequency Input Window.

Marker 1



To use Marker 1 MKR 1, press the **Marker(DEL)** Marker DEL key in Center Marker status. When it turns to Marker 1 mode, Marker mode icon is changed to MKR. And frequency input window is changed to Center Marker to Marker 1 MKR 1.

To move the Marker 1, use the **Up/Down** ⌃⌄ keys, or the **Knob** ◎ key. Then the frequency value and level value are displayed on frequency input window

STEP 1

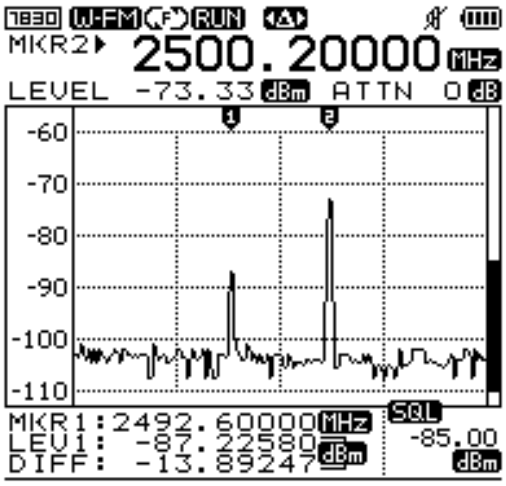
- Press the **Marker (DEL)** Marker DEL Key**.**
- Check the Marker 1 MKR mode in display window

STEP 2

- To move the Marker 1 to wanted plot point, please use the **Up/Down** ⌃⌄ keys, or **Knob** ◎ key.
- Then the frequency value and level value are displayed in the frequency input window

Marker

Delta Marker



Press the **Marker (DEL)** Marker DEL Key until the Marker mode icon is changed to Delta Marker Δ in the display window. And in this case, Marker 2 is added.

The Marker mode is the total four modes. And the changed order of Marker mode is as below:

Center → Marker 1 → Delta Maker → Squelch Marker

CAUTION

To handle the Marker 1, user can set up the marker 1 in Marker mode 1

To handle the Marker 2, user can set up the marker 2 in Delta Marker

When user set up the Delta Marker, the frequency value and level value of Marker 2 are displayed in the frequency input window. The frequency value and level value of Marker 1, and the difference level value between Marker 1 and Marker 2 are displayed in the Marker window

STEP 1

- Press the **Marker (DEL)** Marker DEL Key**.**
- Check the Delta Marker  mode in the display window

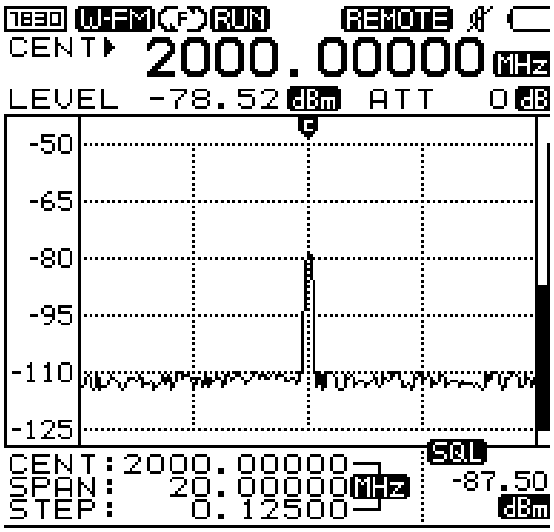
STEP 2

- To move the Marker 1 to wanted plot point, please use the **Up/Down** keys, or **Knob** key.
- Then, the frequency value and level value of Marker 2 are displayed in the frequency input window.

  The frequency value and level value of Marker 1, and the difference level value between Marker 1 and Marker 2 are displayed in the Marker window. Then the frequency value and level value are displayed in the frequency input window

Marker

Squelch Marker



To know the magnitude of frequency, user can use the Squelch Marker. And the Squelch Marker is the right Marker on the vertical axis of the display window.

Also, user can set up the Squelch Marker for setting the Squelch Level of Sweep mode and speaker output for a larger signal than Squelch Level through modulation for audio frequency range. (Modulation: Frequency modulation, Amplitude modulation, and SSB Modulation)

User can hear the radio using upper method.

Press the **Marker (DEL)** Marker DEL Key until the Marker mode icon is changed to the Squelch Marker ÷S in the display window.

STEP 1

- Press the **Marker** Marker DEL key.
- Check the Squelch Marker ±S mode.

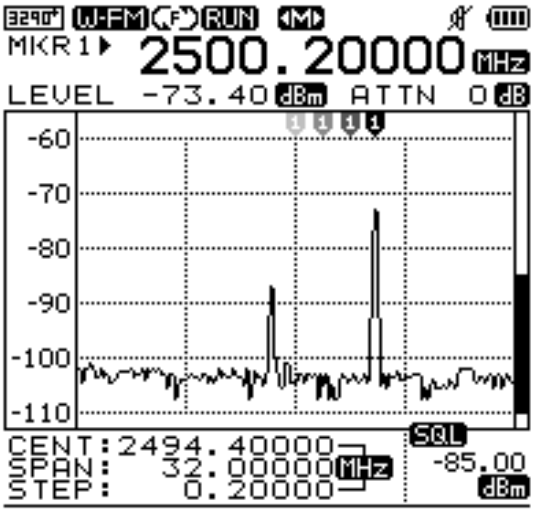
STEP 2

- Move the Squelch Marker to wanted point using the **Up/Down** ^ v Keys or **Knob** Key.
- The squelch value is displayed in the lower right display window.

Marker

Functions using Marker

- **Peak Search**



To use the Peak Search function, this function must be run in Marker 1 mode.

Press the **Marker (DEL)** Key until the Marker 1 icon and Marker 1 are displayed in the display window.

The Marker mode is the total four modes and the changed order of Marker mode is as below:

Center → Marker 1 → Delta Maker → Squelch Marker.

Move the Marker 1 to wanted point using the **Up/Down** Keys or **Knob** Key.

Press the **Shift** key to change the 7830 icon to the SHIFT. And press the **No. 4 (PK Search)** key.

STEP 1

- Press the **Marker (DEL)** [Marker DEL] Key**.**
- Check the Marker 1  mode in the display window.

STEP 2

- Press the **Shift** [Shift] key

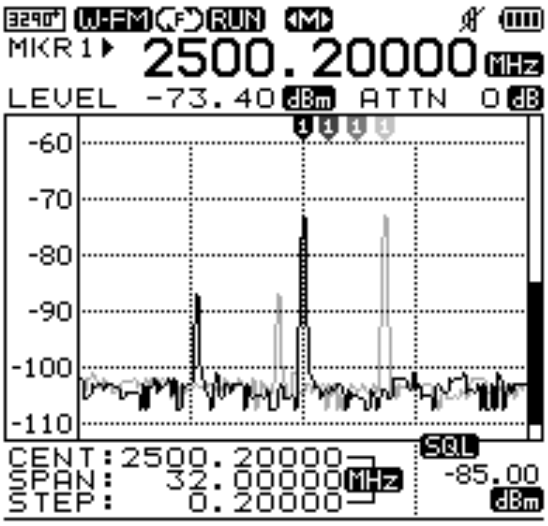
STEP 3

- Press the **No. 4 (PK Search)** [4] key.
  Then, the Marker 1 is moved to the peak point, and the frequency value and level value are displayed in the frequency input window

The function for Peak Search must be run in only Marker 1  **mode**

Marker

- **Peak/Marker to Center**



To use the function of moving the normal Marker 1 or Marker 1 of peak value to the center of display window, this function must be run in Marker 1 mode.

First, Move the Marker 1 to wanted frequency point for Peak/Marker to Center using the **Up/Down** Keys or **Knob** Key.

Next, press the **Shift** key to change the upper right icon to . And press the **No. 5 (Marker to CNT)** Key**.**

Then, the Marker 1 position will be in the center of the display window (Center frequency).

STEP 1

- Press the Marker (DEL) [Marker DEL] Key.
- Check the Marker 1  mode in the display window.

STEP 2

- Move the Marker 1 to users' desired point using the **Up/Down** [^] [v] Keys or **Knob** Key

STEP 3

- Run the function for Peak Search

STEP 4

- Press the **Shift** [Shift] key

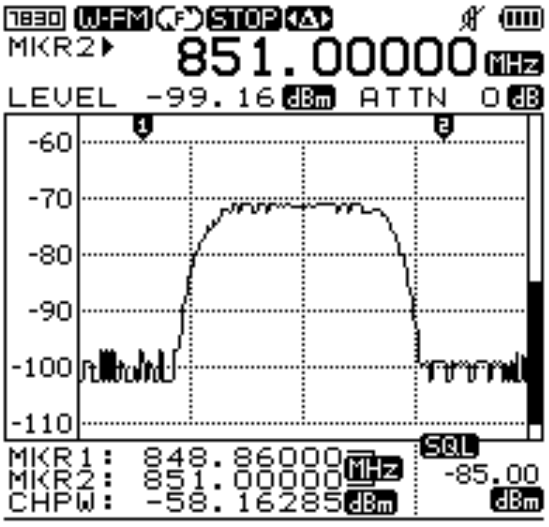
STEP 5

- Press the **No. 5 (Marker to CNT)** [5] key

The function for Peak/Marker to Center must be run only in Marker 1  mode

Marker

- **Channel Power Measurement**



You can enter the mode to measure the channel power either by pressing **shift** Shift **+ number 6 (CH POWER)** or selecting **CH. POWER item from the Marker menu in the Main Menu bar.**

The frequency input window will display Channel Power Measurement (CHPW) and Level. And current center of measurement, span, and bandwidth of the measuring channel power will be shown at the bottom window.

The Channel Power Bandwidth is set to 1/2 of the span by default.

This Channel Power Bandwidth can be adjusted using either the **Up/Down** ^ v **key** or the **wheel** **key**. The center frequency can be changed using the number keys, and span can be changed by pressing **Shift** Shift **+ number 2 (SPAN)**.

MKR→CF does not function when at Channel Power mode. And when you press the **Peak Search or the Marker key**, the Channel Power measuring mode will be terminated and the function which you pressed will be on.

STEP 1

- Press the **Marker (DEL)** [Marker DEL] Key
- Check the Marker 1 mode  in the display window

STEP 2

- Move the Marker 1 to users desired point using the **Up/Down** [^] [v] Keys or **Knob** Key

STEP 3

- Press the **Marker** [Marker DEL] key.
- Check the Delta Marker  mode

STEP 4

- Move the Marker 2 to users desired point using the **Up/Down** [^] [v] Keys or **Knob** Key

STEP 5

- Press the **Shift** [Shift] key

STEP 6

- Press the **No. 5 (Marker to CNT)** [5] key

CAUTION

The function for Channel Power Measurement must be run only in Delta Marker  of four Marker modes.

Marker 1 of Delta Marker must be set up in Marker 1

Setting of Attenuator

Setting for Internal or External Attenuator

The internal attenuator is used for maximum input signal -20dBm with Menu function.

To set the internal attenuator, press the **Shift** [Shift] key to change the upper right icon [7830] to [SHIFT].

And press the **No. 9 (ATTN)** [9] key**.**

To adjust the value of internal attenuator, press the **Up/Down** [^][v] Keys or rotate the **Knob** key. And Press the **Enter** [Enter] key.

If the input signal is larger than -20dBm (ex. -10dBm, 0dBm, and etc), user can use the user's external attenuator.

Settings of the EXT. ATTEN. Are shown below.

LCD Light

The LCD Light is designed to ease the use of the instrument in a dark location.

Press the **Shift** [Shift] key to change the upper right icon 7830 to SHIFT.

And press the **No. 7 (LCD Light)** [7] key.

*The Power ON/OFF of the LCD Light will toggle

STEP 1

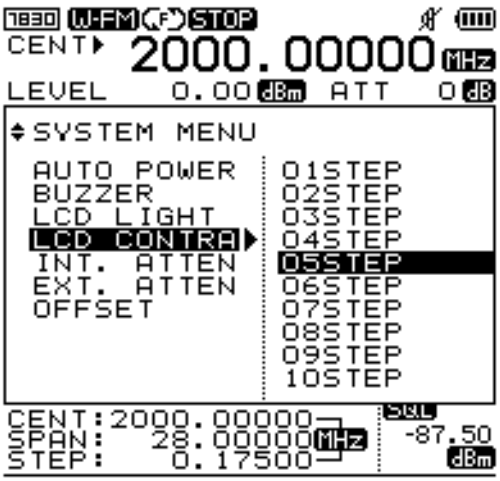
- Press the **Shift** [Shift] key

STEP 2

- Press the **No. 7 (LCD Light)** [7] key

If the LCD light is ON, the current of battery is relatively larger than when LCD light OFF. In other words using time of system is shorter

LCD Contrast



The function of LCD contrast is to adjust the contrast for the remaining battery capacity.

Press the **Shift** [Shift] key to change the upper right icon 783O to SHIFT.

And press the **No. 8 (LCD Contrast)** [8] key.

The LCD contrast is adjusted by using the **Up/Down** [^][v] keys or **Knob** key. And press the **Enter** [Enter] key.

STEP 1

- Press the **Shift** [Shift] key

STEP 2

- Press the **No. 8 (LCD Contrast)** [8] key

STEP 3

- To adjust the LCD contrast, use the **Up/Down** [^][v] keys or **Knob** key and press the **Enter** [Enter] key

Buzzer ON/OFF

User can set the Buzzer ON/OFF (Toggle ON/OFF)

Press the **Shift** Shift Key. Then the Icon 7830 of left upper window is changed to shift icon SHIFT.

And press the **Dot** . Key.

STEP 1

- Press the **Shift** Shift key

STEP 2

- Press the **Dot** . Key

Save/Load

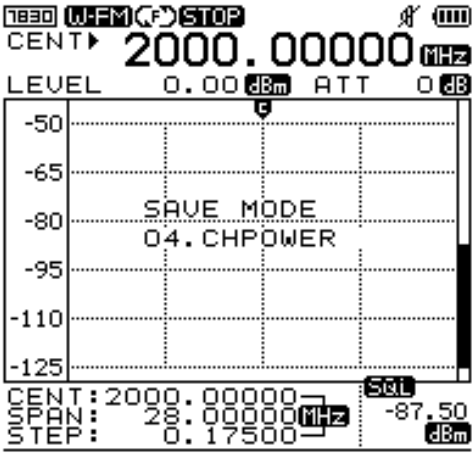
The function of Save/Load is for the Waveform and Setup Statuses.

The function of Save is for concurrently saving the Waveform and Setup Status in memory.
And the saved Setup Status in memory includes the following information: Reception mode, Sweep mode, Frequency range, Step value, and Span value. User can use this with Menu or Multi key.

The function of Load is for loading the saved Waveform and Setup Status in memory.
If user only wants the Setup Status, please load the saved file for desired Setup Status. And press the Run key. Then this measuring instrument will complete the Run-scanning operation. User can only use this in Menu.

The function of Delete is for deleting the saved file. Also User can only use this in the Menu

Save



STEP 1

- Press the **Shift** [Shift] key

STEP 2

- Press the **Enter** [Enter] key

STEP 3

- To save the waveform or setup status, a name with at least 7 characters is required.
- To select the first character. Use the **Up/Down** [^][v] keys. And press the **Enter** [Enter] key
- If want to save the file name fewer than 10 characters, press the “END’ on stated inputted file name.

STEP 4

- To delete the character, press the **Marker** [Marker DEL] key

STEP 5

- When all 7 characters included blank are typed, press the **Enter** [Enter]key. Then, output message for SAVE OK is displayed.

“SAVE OK”

- If user does not type the all 7 characters included blank, the function of save is not completed

STEP 6

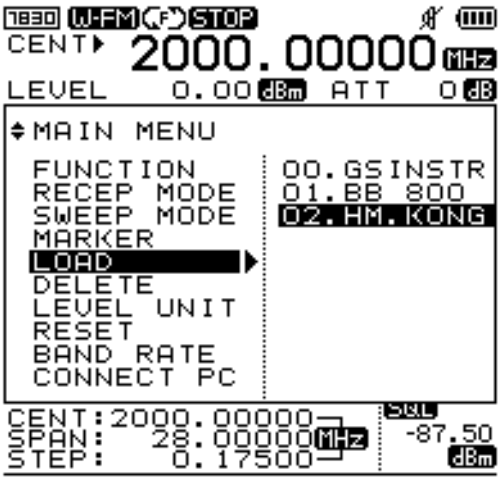
- To cancel the Save, press the **Marker** [Marker DEL] key until the first character is deleted. And additionally press the **Marker** [Marker DEL] key one time.
- Then the Save is canceled and the output message is displayed as below.

“SAVE FAILED”

- The values to be saved are signal and system setting values. Buzzer, LCD contrast and LCD light states are not saved.

Save/Load

Load



STEP 1

- Press the **Shift** Shift key

STEP 2

- Press the **Enter** Enter key

STEP 3

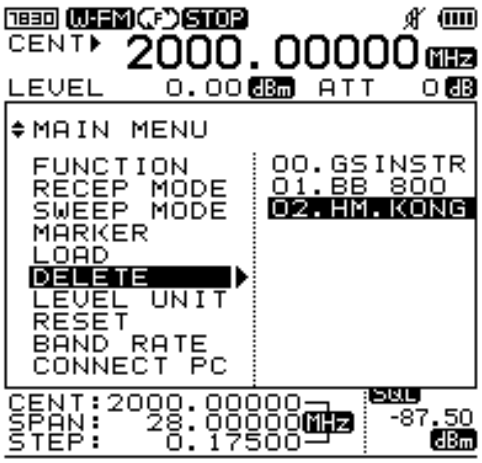
- To save the waveform or setup status, a name with at least 7 characters is required.
- To select the first character. Use the **Up/Down** ⌃⌄ keys. And press the **Enter** Enter key

The function of Load is to load the saved waveform and setup status.

If user only wants to load only setup status, load the user's saved data and press the **Run** Run GHz key.

Then system will run in loading setup status. (Run-scanning)

Delete



STEP 1

- Press the **Menu** [Menu] key

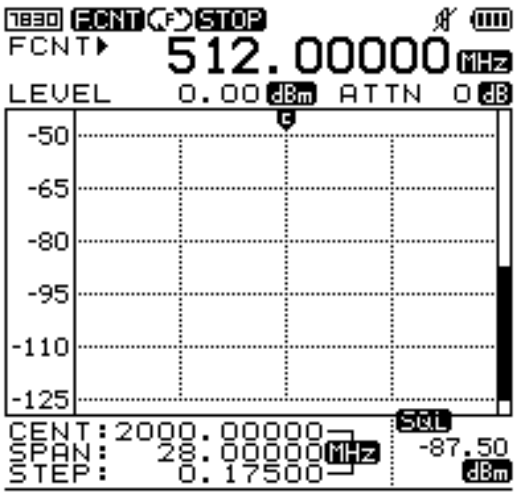
STEP 2

- To select the DELETE, use the **Up/Down** [^][v] keys or **Knob** key and press the **Enter** [Enter] key

STEP 3

- To delete the saved data, select the user's saved data using the **Up/Down** [^][v] keys or **Knob** key. And press the **Enter** [Enter] key. Then the saved data will be deleted

Frequency Counter



Select the F.counter under Main Menu – function

The input connector for the frequency counter is BNC connector.

When the input level is inputted into the Frequency Counter, the measured frequency value is displayed in the frequency input window

Input level is same as below.

DANGER

9 MHz to 2,000 MHz : 150m Vrms

20 MHz to 1,000 MHz : 100m Vrms

2,000 MHz to 2,900 MHz : 400m Vrms

STEP 1

- Press the **Menu** Menu key

STEP 2

- To select the FUCTION, use the **Up/Down** keys or **Knob** key and press the **Enter** Enter key.
- Then sub menu is opened.

STEP 3

- To select the F. COUNTER (Frequency Counter), use the **Up/Down** keys or **Knob** key and press the **Enter** Enter key

STEP 4

- The icon F.CNT is displayed from the other icon.

The FCNT is displayed in the frequency input window

STEP 5

- When the input level is inputted in the Frequency Counter using BNC connector, the measured frequency value is displayed in the frequency input window

STEP 6

- To change the Frequency Counter mode to Spectrum mode, run the upper Step 1 to Step 3. At this time, select the SPECTRUM not F. COUNTER in **Step 3**

Power Source

Checking for Battery

To check the battery's remained capacity Battery, user can refer to the battery icon in the upper area of display window 

- **How to use and replace the battery**

The power system of Protek 7830 uses the Ni-MH rechargeable batteries. Then, the power system supports fast charging. The charger for the Ni-MH batteries is controlled by the voltage and temperature of the battery cells.

The Ni-MH rechargeable batteries must be used for the safe and stable power source. And if the charging is required, please avoid the site with high temperature or high humidity

Setting of the Unit

The setting for level unit can be set up in the Menu.

The level unit can be set up as below

dBm

dBuV

dBmV

STEP 1

- Press the **Menu** Menu key

STEP 2

- To select the LEVEL UNIT, use the **Up/Down** keys or **Knob** key and press the **Enter** Enter key.

Then sub menu is opened.

STEP 3

- To select the user's wanted level unit, use the **Up/Down** keys or **Knob** key and press the **Enter** Enter key

Reset

The function of Reset is for initializing the memory or system.

The three kinds of resets are supported. And these resets are run through the Menu

- **Preset**

  System Reboot for initial setup status.
  (Center Frequency, Span Frequency, Marker and etc)

- **Memory CLR**

  The user's saved data will be cleared. (Memory Cleared)

- **System INIT**

  The upper two resets (PRESET and MEMORY CLR) are run.
  Then, system reboot for initial setup status and the user's saved data will be cleared

STEP 1

- Press the **Menu** [Menu] key

STEP 2

- To select the RESET, use the **Up/Down** [^][v] keys or **Knob** key and press the Enter [Enter] key.
- Then, sub menu is opened.

STEP 3

- To run the wanted Reset, use the **Up/Down** [^][v] keys or **Knob** key and press the **Enter** [Enter] key.
- Then, the selected reset will be run

Baud Rate

Setting of the Baud Rate

The setting of the baud rate is for the transmission speed.
The Baud Rate between PC and system is same as below.

115,200 BPS
57,600 BPS
38,400 BPS
19,200 BPS
9,600 BPS
4,800 BPS

STEP 1

- Press the **Menu** Menu key

STEP 2

- To select the BAUD RATE, use the **Up/Down** keys or **Knob** key and press the **Enter** Enter key.
Then, sub menu is opened.

STEP 3

- To select the wanted baud rate value, use the **Up/Down** keys or **Knob** key and press the **Enter** Enter key

Connection for PC

Setting of the Connection for PC

The function of CONNECT PC is for connecting to a PC.
First, the GUI program is run on the PC. And the serial cable is connected between PC and Protek 7830.
Next, run the REMOTE PC from Menu.

- NONE
- REMOTE PC

STEP 1

- Press the **Menu** Enter key

STEP 2

- To select the CONNECT PC, use the **Up/Down** keys or **Knob** key and press the **Enter** Enter key.

Then, sub menu is opened.

STEP 3

- To select the REMOTE PC, use the **Up/Down** keys or **Knob** key and press the **Enter** Enter key.

Then, the connection between the PC and the system is running.

Auto Power

The Auto Power function should be used to conserve system power.

When the power OFF time is enabled (“NONE” is not selected), the power source will be turned off automatically if the user dose not use the system for the auto power OFF period of time.

The auto power OFF time is same as below

NONE

05MINUTES

10MINUTES

20MINUTES

30MINUTES

STEP 1

- Press the **Menu** Menu key twice

STEP 2

- To select the AUTO POWER, use the **Up/Down** keys or **Knob** key and press the **Enter** Enter key.

Then, sub menu is opened.

STEP 3

- To select the auto power time, use the **Up/Down** keys or **Knob** key and press the **Enter** Enter key

Offset

Level Offset compensates for any loss due to the cabling.
Offset adds the value of +Offset to all values of measurement.

STEP 1

- Press the **Menu** Menu key twice

STEP 2

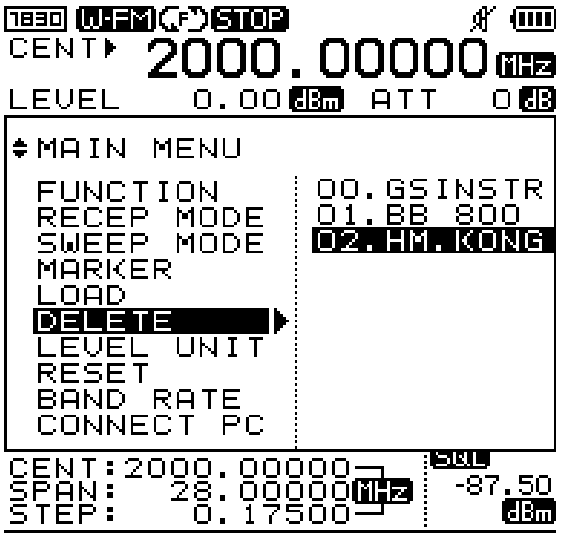
- Move the cursor on PC Connect using the **Up/Down** ^ v Keys or **knob** Key.

STEP 3

- Push the **Enter** Enter Key and then move the submenu.
- Move the dB value of Offset.
- Push the **Enter** Enter Key

STEP 4

- Push the **Menu** Menu Key one more time to exit the System



There are two modes. One is Multi key function with the **Shift** Shift Key and the other is to select other functions.

Functions can be selected using the multi key or through the Menu.

The functions that could be selected in Menu mode are as blow.

Level Unit

Reset

Band Rate

Connect PC

To exit from Menu or System, push the **Menu** Menu Key or push the Dot key. These keys will move through the menu either lower or higher.

Menu

STEP 1

- Press the **Menu** [Menu] key twice

STEP 2

- To select wanted function, use the **Up/Down** [^][v] Keys or the **Knob** Key.

STEP 3

- Push **the Enter** [Enter] Key

STEP 4

- After selecting function of lower item or On/Off, push the **Enter** [Enter] Key

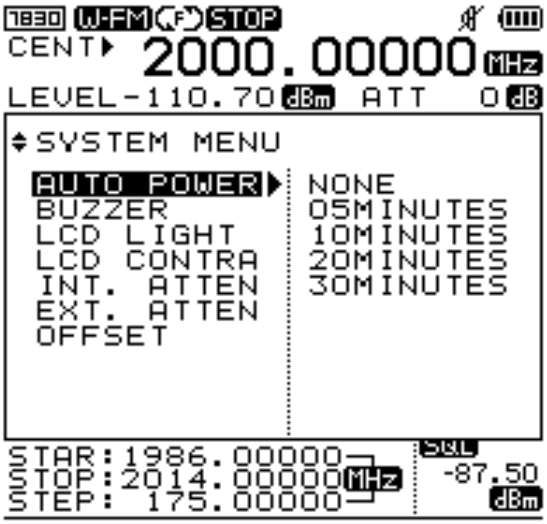
STEP 5

- Exit the Menu after pushing the **Menu** [Menu] Key twice.
- When the **Menu** [Menu] Key is pushed one time, you are in System

Function	Spectrum	Set up the functions of Spectrum and frequency counter.
	Frequency Counter	
	TEST Mode	
Reception Mode	N-FM	Set up the Reception Mode. It's possible to set up with the **Shift** Key(Shift button is upside-down please check all buttons to confirm they are correct.)
	W-FM	
	SSB	
	AM	
Sweep Mode	Free Run	Set up the Sweep Mode. The mode can be set up with the **Shift** Key.
	Squelch Run	
	Single Run	
Marker	None	Marker or function using the Marker. The mode can be set up with the **Shift** Key.
	Marker	
	Delta MKR	
	Squelch MKR	
	PK Search	
	MKR 2 CENT	
	CHAN POWER	
Save	Save Data	The mode can be set up with the **Shift** Key.
Load	Load Data	The mode can be set up with the **Shift** Key.
Level Unit	dBm	
	dBuV	
	dBmV	

Menu

Reset	Pre Reset	Restarting the System and clear all parameters for set up
	Memory CLR	Delete the stored data
	System INI	All Reset – restarting the system and delete the stored data
Band Rate	115,200 BPS	Select the speed of serial communication between the unit and PC
	57,600 BPS	
	38,400 BPS	
	19,200 BPS	
	9,600 BPS	
	4,800 BPS	
Connect PC	None	Select the connection to PC
	Remote PC	



There are modes that select the function of Multi key using the **Shift** [Shift] Key and the other functions.

Functions can be selected using the multi key and the Menu.

The functions that can be selected in Menu mode are as blow.

To exit from Menu or System, push the [Menu] Key or push the Dot key, this will move you to lower menu items or to higher menu items.

System

STEP 1

- Press the **Menu** [Menu] Key

STEP 2

- Press the **Menu** [Menu] Key once more.

STEP 3

- To select desired function, use the **Up/Down** [^][v] Keys or the **Knob** Key

STEP 4

- Press the **Enter** [Enter] Key

STEP 5

- After selecting a lower item function or On/Off, push the **Enter** [Enter] Key

STEP 6

- Push the **Menu** [Menu] Key once to exit the System

Auto Power	**None** **05 Minutes** **10 Minutes** **20 Minutes** **30 Minutes**	Select auto power saving mode.
Buzzer	**ON** **OFF**	Select Buzzer On/Off. It could be set up with the Shift Key(Shift Key Icon is upside down. Please check all icons to fix this.)
LCD Light	**ON** **OFF**	Select LCD Light On/Off. It can be set up with the Shift Key.
LCD Contrast	**1 to 10 Step**	
INT. Atten.	**0 dB** **10 dB** **20 dB** **30 dB** **35 dB**	
EXT. Atten.	**0 dB to 90 dB**	
Offset	**-99.0 dB to 99.0 dB**	
Default save	**SAVE**	During booting, save default value to be applied. When Saving the values, all values will be saved except Signal.

6 Description of key operation

Run [GHz] Run GHz

- **Instruction to start scanning frequencies**

  After power on, this button will work as it did under the most recent setup, or when Squelch Run or Single Run functions are active.

  [Please refer to the **Scan** in description of basic operation details if needed]

- **Units input function can be used to set up Start/ Stop/ Scan/ Center frequencies.**

  After inputting the frequency values, push the k GHz key to view the units.

Mode [MHz] Mode MHz

- **Selecting Reception Mode**

  The following Reception Modes can be selected WFM W-FM, NFM N-FM,AM AM and SSB SSB.
  [Please refer to the Reception Mode section for detailed description of basic operation.]

- **Units can be entered when setting up Start/Stop/Scan/Center frequencies.**

  Push the MHz key after inputting the frequencies to view the values.

Sweep [kHz] Sweep kHz

- **Selecting Sweep Mode**

  This button selects the Sweep Mode such as FREE Run (F), SQUELCH Run (S) and SINGLE Run (1)

  [Please refer to the **Sweep Mode** section for a detailed description of basic operation.]

- **The units input function can be used to set up Start/ Stop/ Scan/ Center frequencies.**

  After input the value of frequency, push the key of kHz for the units its.

Marker [DEL] Marker DEL

- **Selecting Marker functions**.

  After pushing this button, please select Marker functions such as Center Marker, Marker 1, Delta Marker and Squelch Marker.

  [Please refer to the **Marker** section for a description of basic operation for more detail.]

- **This is the Delete function when setting up Start/Stop/Scan/Center frequencies.**

  When inputting the frequency values, the **Marker** Marker DEL Key can be used as the **Delete** Key.

  This key functions as a backspace key on a PC.

No. 1 [Start/Stop] 1

- **Press the No. 1 [1] key to input the value of 1.**

  To input the value of numeral 1 in the Start/Stop/Scan/Center frequencies, please use the **No. 1** [1] Key.

- **Pressing No, 1 key and the Shift [Shift] Key will active the Input function for Start/Stop Mode.**

  Select the Start/Stop Mode by pushing the **Shift** [Shift] Key and than push the numeral [1] Key.

  [Please refer to the **Frequency Input** section for a description of basic operation if more detail is needed.].

No. 2 [Span] 2

- **Press the No. 2 [2] key to input the value of 2.**

  Input the value of numeral 2 in the Start/Stop/Scan/Center Mode by pressing the **No. 2** [2] Key.

- **Span Frequency Input function can be activated by pushing Shift [Shift] Key**

  By pushing the **Shift** [Shift] Key and than pushing the **No. 2** [2] Key, the Span Mode can be activated.

  [Please refer to the **Span** section for a detailed description of basic operation if required.]

No. 3 [Level] 3

- **Push the No. 3 [3] key to input the value of 3.**

  In order to input the value of numeral 3 in the Start/Stop/Scan/Center frequencies, push the **No. 3** [3] Key.

- **Display Level Adjustment Function by pushing Shift [Shift] Key.**

  On pushing the **Shift** [Shift] Key and then push the **No. 3** [3] Key, Basic Level of vertical axis and Level Step on display could be adjusted.

  [Please refer to the **Display Level Adjustment** section for a detailed description of basic operation if need.]

No. 4 [PK Search; Peak Search] 4

- **Push the No. 4 [4] key to input the value of 4**

  Use the **No. 4** [4] Key to input the value of numeral 4 in the Star/ Stoop/ Scan/ Center frequencies.

- **Search Function and Peak Search can be activated by selecting the Marker after pushing the Shift [Shift] Key.**

  Peak Search Function, one of the Marker Functions, can be selected by pushing the **Shift** [Shift] Key and then pushing the **No. 4** [4] Key.

  [Please refer to the section for **Peak Search** using the Marker for a detailed description of basic operation if needed.]

No. 5 [MKR to CNT; Marker to Center] 5

- **Push the No. 5 5 key to input the value of 5.**

  Push the **No. 5** 5 Key to input the value of numeral 5 in the Start/ Stop /Scan/ Center frequencies.

- **Activate the Marker to Center Function using the Marker menu after pushing the Shift Shift Key.**

  On pushing the **Shift** Shift Key and then push the **No. 5** 5 Key, Marker to Center, one of the Marker Function, can be selected.

  [Please refer to the **Marker to Center** section for a detailed description for using the Marker Function if needed.]

No. 6 [CH Power; Channel Power] 6

- **Push the No. 6 6 key to input the value of 6.**

  The **No. 6** 6 Key is used to input the value of numeral 6 in the Start/Stop/Scan/Center frequencies.

- **Selecting Channel Power Function using the Marker function after pushing the Shift Shift Key**

  By pushing the **Shift** Shift key and then the **No. 6** 6 Key, Channel Power, one of Marker Function, can be selected.

  [Please refer to the **Channel Power** using the Marker function section for a detailed description of basic operation if needed]

No. 7 [LCD Light] 7

- **Push the No. 7 [7] key to input the value of 7.**

  When inputting the value of numeral 7 in the Start/Stop/Scan/Center frequencies, the **No. 7** [7] Key is used

- **LCD Light Function after pushing the Shift [Shift] Key**

  By pushing the **Shift** [Shift] key and then pushing the **No. 7** [7] Key, LCD Light function can be selected.

  [Please refer to the **LCD Light** section for details about basic operation if needed.]

No. 8 [LCD CONT; LCD Contrast] 8

- **Push the No. 8 [8] key to input the value of 8.**

  To input the value of numeral 8 in the Start/Stop/Scan/Center frequencies, the **No. 8** [8] Key is used.

- **LCD Contrast Function after pushing the Shift [Shift] Key**

  By pushing the **Shift** [Shift] key and then pushing the **No. 8** [8] Key, LCD Contrast function can be selected.

  [Please refer to the **LCD Contrast** section for details on basic operation.]

No. 9 [Attenuator] 9

- **Push the No. 9 [9] key to input the value of 9.**

  To input the value of numeral 9 in the Start/Stop/Scan/Center frequencies, the **No. 9** [9] Key is used

- **Attenuator Setup Function after pushing the Shift [Shift] Key**

  By pushing the **Shift** [Shift] key and then pushing the **No. 9** [9] Key, Attenuator function can be selected.

  [Please refer to the **Attenuator Setup** section for details about basic operation.]

No. 0 [System] 0

- **Push the No. 0 [0] key to input the value of 0.**

  When inputting the value of numeral 0 in the Start/Stop/Scan/Center frequencies, the **No. 0** [0] Key is used.

- **System Setup Function after pushing the Shift [Shift] Key**

  By pushing the **Shift** [Shift] key and then pushing the **No. 0** [0] Key, System Setup function can be selected.

  [Please refer to the **System Setup** section for details about basic operation.]

Shift [Shift]

- **Using the Function Key**

The **Shift** [Shift] Key dose not performs any function by itself.
The Shift Key can be used with functions printed below the numeral keys.
If the shift key is pressed twice, CENT/SPAN located on bottom of display is changed to START/STOP.

Dot [Buzzer] [.]

- **The Dot [.] key should be used to input a decimal point**

When input the value of Decimal Point in the Start/Stop/Scan/Center frequencies, this key is used.

- **Buzzer Setup Function after pushing the Shift [Shift] Key**

By pushing the **Shift** [Shift] key and then pushing the **Dot** [.] Key, Buzzer On or OFF can be selected.

[Please refer to the **Buzzer** section for details on basic operation.]

- **Return Function on Menu and System**

Return Function is used to return from lower Menu to higher Menu on Menu and System.

Menu [Load] Menu

- **Menu Function**

  Various functions can be selected after entering Menu item.

  At the Menu item, pushing the **Menu** Menu Key once more; will active the System item.

  [Refer the section of **Menu and System** of basic operation if need more detail]

- **Load Function after pushing the Shift Shift Key.**

  By pushing the **Shift** Shift key and then pushing the **Menu** Menu Key, stored Data can be loaded.

  [Please refer to the **Store Mode** section for details of basic operation.]

Enter [Save] Enter

- **Enter Function**

  The Enter Key is used to select Menu or System items.

- **Save/Load Function after pushing Shift Shift Key**

  By pushing the **Shift** Shift key and then pushing the **Menu** Enter Key, Data can be saved.

  [Please refer to the **Save/Load** section for details about basic operation.]

- **Up/Down Keys and Knob Key Functions**

  Movement of Marker, Menu items and System

  After setting the Span, the Span can be changed using the Up/Down key.

  After setting the Reference level, the Reference level can be changed using Up/Down key.